Brain Imaging-Based Biomarker for Alzheimer's Disease

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Introduction

o Alzheimer's disease is a progressive brain disorder that slowly destroys cognitive functions such as thinking skills, memory, and important motor functions that help us carry out daily tasks.

o This disease mainly targets people in their mid-60s or later, causing them a great deal of distress.

o There is currently no cure for this disease and so an early diagnosis is an important way to help slow the progression by undergoing early intervention and maintain quality of life.

Aim

o This project was undertaken to develop and validate a brain imaging-based biomarker that can help predict an early diagnosis of Alzheimer's Disease though the usage of a machine learning algorithm.

o Develop a database that will then be given to the machine learning algorithm to learn from so it can accurately identify an early diagnosis.

Methodology

o Analyze human brain imaging data from the Alzheimer's Disease Neuroimaging Initiative.

o Collect the training data for the machine learning algorithm by downloading various types of brain imaging scans from numerous types of patients with a variety of cognitive impairments.

o Organize the brain scans into a database by organizing brain imaging files based on research group, subject ID, modality, visit number, and image files.
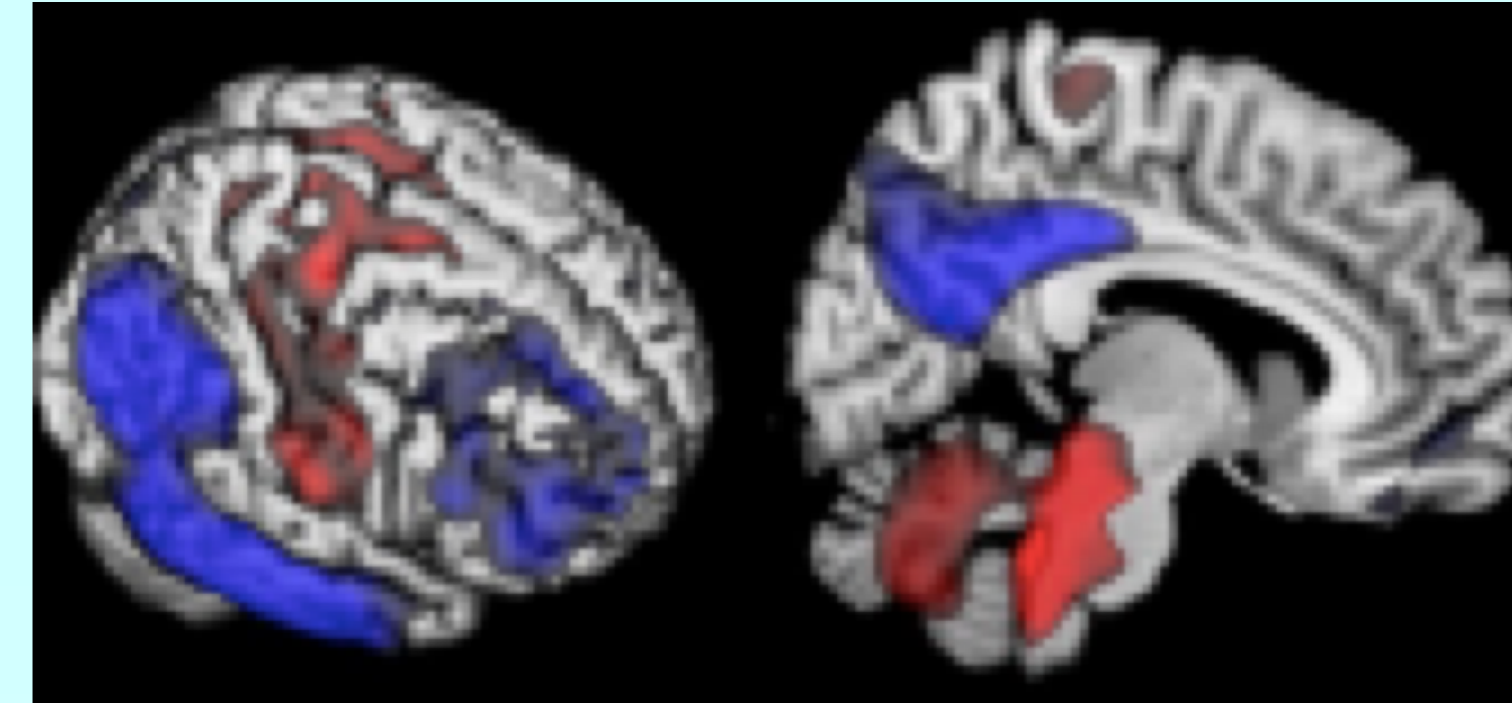

Image 1. Depiction of an FDG-PET scan used in research

An early diagnosis of Alzheimer's Disease can provide those suffering with a sense of clarity, a better chance of benefiting from treatment, and maximize their quality of life
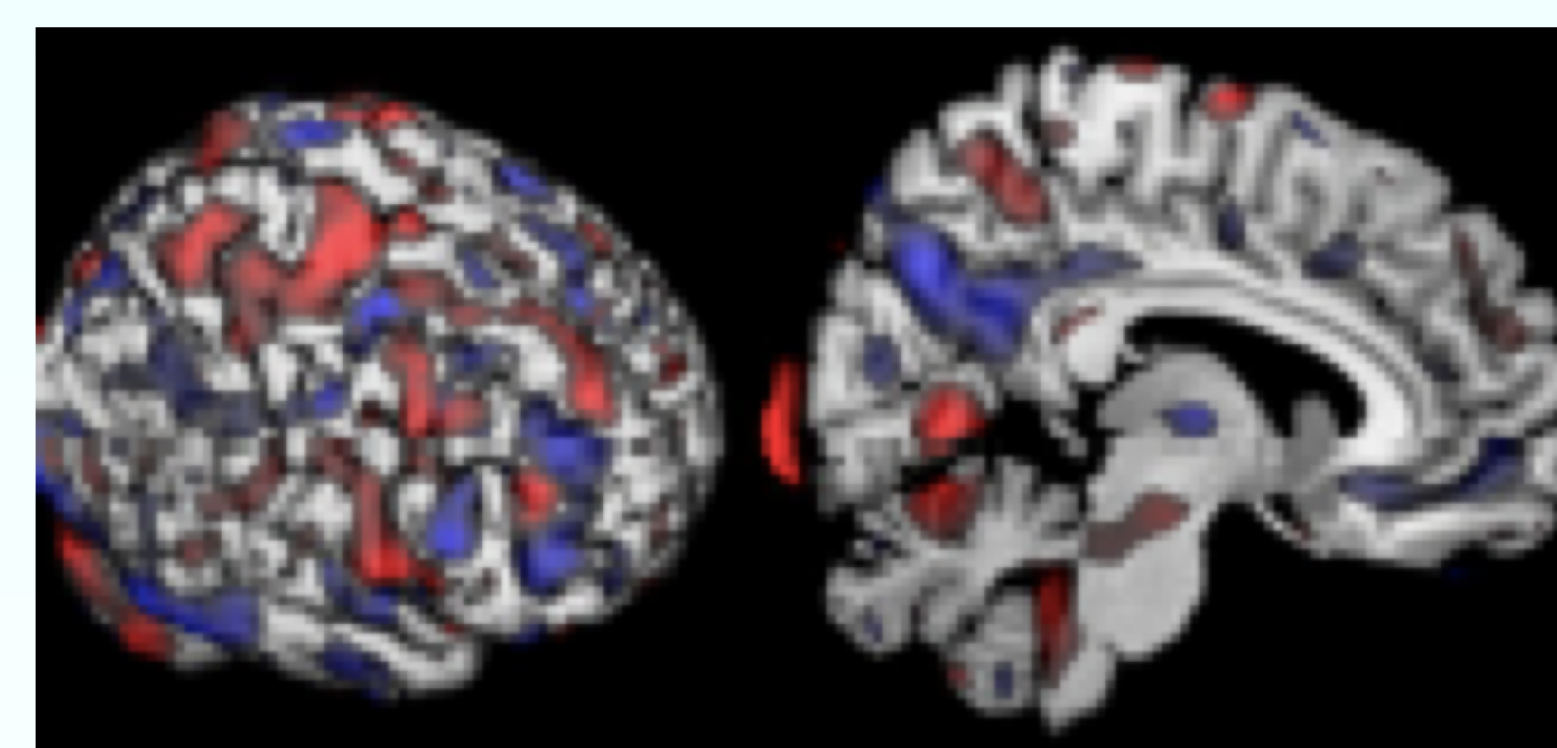

Image 2. FDG-PET scan of the brain used in research

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Overall Project Significance

o Once entire project is complete the machine learning algorithm will be able to predict an early diagnosis of Alzheimer's disease.

o Will be able to provide a percentage of the chance a person has of developing Alzheimer's disease.

o Will also be able to give a timepoint as to when a person may begin to develop Alzheimer's disease.

o Providing those who are beginning to suffer from some mild cognitive impairments with a sense of clarity as to whether or not they may develop Alzheimer's Disease in the future.

o Allowing those the opportunity to be treated appropriately for their condition as well as a better chance of benefiting from treatment.

Future Directions

o Completion of database by pre-processing the brain scans.

o Further completion of the machine learning algorithm.

o Provide machine learning algorithm with the training data from the complete database to learn from so that it will be able to recognize the different types of brain scans as well as specific biomarkers and correctly identify a possible early diagnosis of Alzheimer's Disease.

Acknowledgements